

Phase analysis by Mössbauer spectrometry

Slovak University of Technology in Bratislava, Exercise STU-07

Main topic: Non-destructive material testing

Keywords: Mössbauer effect, material testing, non-destructive analysis, phase analysis, Mössbauer spectroscopy, material compound, iron alloys

Purpose: The objective of the experiment is to demonstrate a phase analysis on iron or tin based material. In general, each investigated sample consists of atoms in more than one phase resp. crystal structure. Each phase is characterized by its own hyperfine structure which results to a superposition of the Mössbauer spectra in measured spectrum. Based on decomposition of measured spectrum to the individual components, each contributed phase can be qualitatively and quantitatively identified.

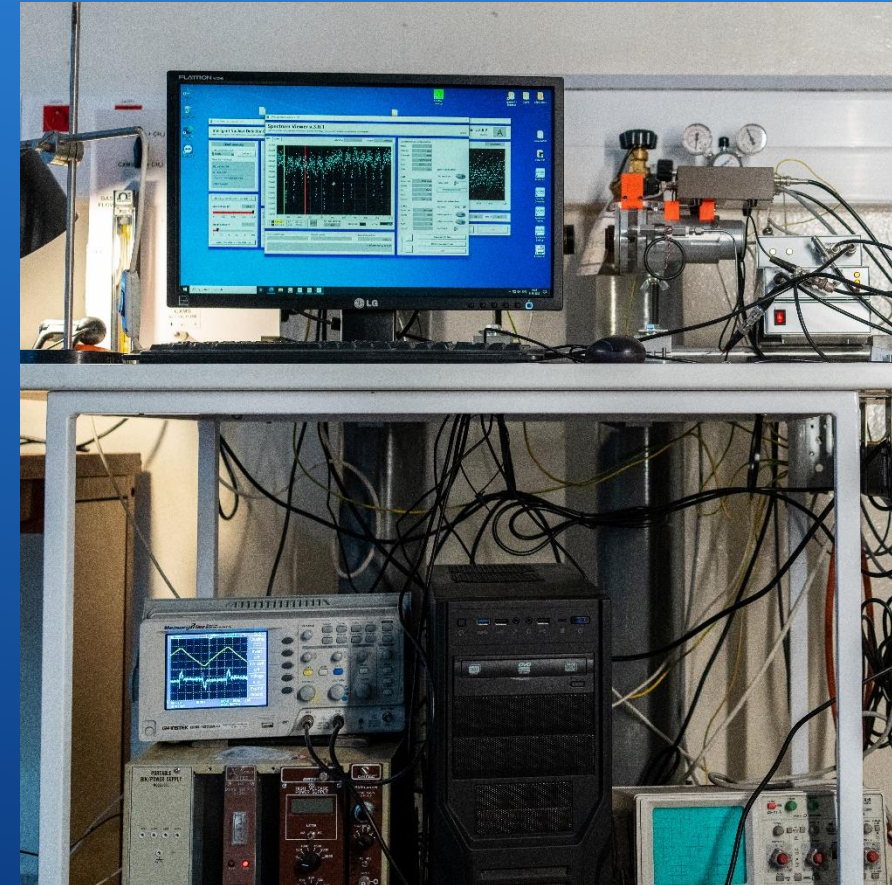
Level of exercise: Basic Advanced Complex
Level of education: BSc MSc PhD

What you will learn:

The students will learn main principles of the Mössbauer spectroscopy, will understand the basic principles of phase analysis and spectrum decomposition and will realize the utilization of Mössbauer spectroscopy for industry.

Important information:

- Minimal size of student group: 2
- Maximal size of student group: 4
- Overall duration of the experiment (in wall clock hours): 2



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Possibility to perform experiment on demand: Yes No

Frequency of occurrence: 2-3 times per year

Examination modalities: report

Teaching languages: English, Slovak

Pre-knowledge required: Knowledge of types, sources and interaction of radiation, theory of hyperfine structures and atomic nucleus structures, knowledge of measurement techniques, detector types, MCA/MCS modes and evaluation of uncertainties

Instruments required for exercise:

- Mössbauer source
- Mössbauer spectrometer

Execution:

- The Mössbauer spectrum is measured for samples which consist of pure phases of iron and unknown mixtures
- Subsequently the measured spectrum is decomposed and each component/spectral line is assigned to a known phase
- The area under the Mössbauer spectrum is used to determine the amount of iron in mixture
- In the phase analysis, it is assumed that each phase contains the same percentage of Fe-57 and the quadrupole doublet resonance lines have the same intensities

Limitations:

Pregnant and breastfeeding women are not allowed to enter the controlled radiation area. Legal age (18) is required.

For more information please visit <http://www.ujfi.fei.stuba.sk/kontakt.php>

